

A
PHILOSOPHIC AND PRACTICAL
INQUIRY
INTO THE
NATURE AND CONSTITUTION
OF
TIMBER;

INCLUDING
AN INVESTIGATION INTO THE CAUSES AND
ORIGIN OF THE DRY ROT;
SOME IMPORTANT CONSIDERATIONS, INTRODUCTORY
TO THE SUGGESTION OF A BETTER METHOD
FOR SEASONING TIMBER;
A PROPOSAL FOR EFFECTUALLY PRESERVING TIMBER
AGAINST EVER CONTRACTING THE DRY
ROT, OR INTERNAL DECAY;
AND THE PARTICULARS AND RESULT OF A SET OF
SUCCESSFUL EXPERIMENTS MADE, AND TENDING
TO ESTABLISH THE AUTHENTICITY OF
THE ABOVE PROPOSAL.

“J’AI BONNE CAUSE.”

BY JOHN LINGARD.

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ADVERTISEMENT.

THE Author begs to state, that the purport of this Treatise is, to submit to the Government of this country, and to the Public at large, a remedy, to stop that dreadful disease in Timber, called the Dry Rot, as also, a palliative to prevent the premature decay of Timber in general; which has been prosecuted by the Author, at great individual expense and labor, for the last two years, upon a series of experiments and study not to be controverted.

This Treatise is not given to the public as a disclosure of the remedy, or as a perfect literary composition, but as matter of fact; and to solicit that patronage, either public or private, as will enable the Author to establish this national desideratum, of such importance to the country.

PREFACE.

So many have been the authors, who have unsuccessfully proposed to themselves the accomplishment of the object to which the present undertaking is directed, and so great has been the difficulty of the subject itself, that some persons will probably, from those very circumstances, be perhaps inclined to consider the present as only a similar attempt to effect what they may, though very erroneously, suppose an impossibility; and consequently will, without reading, reject it.

But to such persons it is apparently necessary to observe, that, in all cases, and in all inventions, many unsuccessful attempts have preceded that which has at length established itself by the strongest evidence of reason and facts; and that, till the actual reception of this last, the subject has been regarded by all, or the greatest part of the rest of mankind, as unattainable. These previous discouragements have not, however, been of sufficient avail to determine better informed persons from exerting their endeavours on other principles; and it is for the interest of the world at large, that sincere and well-weighed attempts, founded on rational grounds, should be at least so far encouraged in the first instance, as to have a fair opportunity afforded for trying the merit of their pretensions to success. What, for example, would have been the state of all the arts, if successive attempts at improvement, at different times, on rational grounds, had never been made or encouraged? or, what must have been the condition of literature or science in general, if one opinion, however erroneous, was not to be questioned or examined, because it had antiquity to boast? or another, however correct, was not to be received or admitted, because it had never

occurred to the minds of authors who had flourished more than two thousand years ago?

Every man of sense and candor must see, it is as great an imputation on his understanding, not to admit or perceive the force of an argument well proved by all the rules of logic and reason, as it would be to credit and give assent to one wholly destitute of those supports. And, although it is not uncommon in these times to hear persons endeavouring to defend groundless assertions, which they have hastily, incautiously, and inconsiderately made, merely because they cannot bring themselves to admit the possibility of their having before been mistaken in their opinions; yet it is evident, that this conduct, instead of raising, tends to ruin their reputation for abilities, with all who can think justly on the subject; because they are obliged to profess, as they invariably do, that they cannot discern what is, perhaps, perfectly clear to every one else. Nothing is, or can be, so injurious to science or intelligence of all kinds, as fallacious arguments; because, by their means, the investigation of truth, instead of being promoted and assisted, is rendered more difficult and laborious. But, on the contrary, it is but justice to acknowledge, that in the instance of the Government, and those in public situations in this country, although from the multitude of unfounded applications they have been obliged to be cautious, yet when once a decided ground of probability for success has been established, they have always been ready to attend to suggestions for material and substantial improvements.

Considering its magnitude and importance to this country at large, it is hoped that, in the present instance, men of science, and those in situations affording the means and power of making experiments, as well as requiring in their nature, that all possible beneficial improvements should be made within their several departments, will see the necessity of judging coolly and deliberately; and that they will, in consequence, candidly lay aside all former impressions, arising from the present mode of conducting the process for seasoning timber for ship-building in this or any other country, or the unsuccessful schemes hitherto proposed to preserve it from decay. It is also trusted, that they will first examine, (and with the more attention and stricter scrutiny, the better,) the facts and principles on which the present proposal rests: and if they find it, as it is believed they will, fully supported, that they will exert themselves to the utmost, in endeavouring to obtain or afford the means of subjecting it to the necessary decisive experiments on a larger scale, for the purpose of establishing its merit; and adopting the remedy, if its utility is satisfactorily proved.

If professional gentlemen in the use of timber would only turn

their eyes to the emporium of magnificent buildings in foreign parts, will they not be convinced, that the long duration of timber was the grand cause for such magnificent erections? Seldom or ever wanting repair, consequently one stupendous pile was erected after the other. If, with a little expense, the timber of this country, as well as that brought from foreign parts, can be made as durable now as in those times, may not the same spirit for magnificence arise in this country? There is no article of more interest and consequence to Great Britain, than timber, both for ship and other building; yet there is no article so neglected in study or practice to improve its durability; and it is often half decayed before brought into use.

PHILOSOPHIC AND PRACTICAL

INQUIRY

&c. &c.

SECTION I.

ON THE EXISTENCE AND PREVALENCE OF DECAY IN TIMBER.

NO person, it is supposed, can be so little acquainted with Natural History, as to be ignorant that, although the progress of growth in timber trees is slow and gradual, yet, when once arrived at maturity, its advances to decay are abundantly rapid. Nor is it imagined necessary to inform any one of the fact of the actual existence of the disease in timber, denominated the Dry Rot; or to remind him, how often it has occasioned expensive litigations between builders and their employers, in order, when it has occurred, to ascertain and determine on whom the loss and expense, which it has produced, ought, in justice and reason, to fall: but it may be, perhaps, matter of new and original intelligence to many persons, to be told, that this evil exists, to an astonishing extent, among the shipping in this and all other countries in Europe, whether employed in the Navy, or for commercial purposes; that no building, in which timber is used, is secure from it, even though the timber has previously undergone the usual process of seasoning; and that a remedy for it, in the case of the Navy of this country alone, would prove, as has been ascertained on an accurate computation, a saving, in the short period of every fourteen years, of not less than twenty millions, at a time when this country is at war.

By persons best acquainted with the subject, it has been ascertained that, on an average, every ship in the Navy, and in the Mer-

chant service of this country, trading to the East or West, or any hot climate, is, in consequence of repairs from time to time made, for the purpose of taking out decayed planks and replacing them with new and sound, very nearly wholly rebuilt in the course of fourteen years. Besides this, it is not uncommon to see a stupendous ship, which has cost the owners fifty thousand pounds in building, condemned to be broken up in a few years;—comparatively few, when we consider that timber is of nearly 200 years growth before it is fit for large ships.

Even in private life, it is no less frequent to find, that whenever a nobleman or gentleman has been at the expense of building or purchasing a noble mansion for his residence, the purchase money has been only a part of what he has had to pay; for the building has been subject to the dry rot, and, in a very short space of time he has had to expend as much more in repairs, in order to remove decayed timbers, and supply their places with sound.

Any discovery or invention, which would in any considerable degree lessen these evils, by retarding, even for a few years, the decay of timber, would so far be entitled to encouragement; but one, if it could be found, which should effectually stop it, by disuniting the principles from which the decay of timber must arise, cannot be too highly praised, or too strongly recommended. That such a discovery is still within the reach of possibility, and even of probability, notwithstanding the failures of those who have hitherto professed to suggest a remedy, it is reasonably presumed will be fully demonstrated in the course of the ensuing pages; and that such an one has been actually found, will, it is imagined, be no less evident, from consulting and weighing the experiments hereafter stated:—it is not the mere hasty suggestion of the moment, but the result of deliberate investigation. Every experiment, that could be suggested, has been tried; and although those stated are only a small part of what have been made, because it would have been too tedious to have inserted the whole, yet it may with truth be asserted, that in no one instance has any failure occurred. And to such an extent has the desire for ascertaining the facts been carried, that gentlemen of the best abilities and information, chemists of the first celebrity and talents, and others in various departments, have been, at different times, consulted on the surest methods of evidencing the positions on which it rests. It has stood them all; and it is conceived that these tests are decisive, and justify its author in asserting, that the desideratum is at length obtained, and that the advantages arising from it will be of the first and highest importance. Some of these will be found hereafter pointed out; but to anticipate all the modes in which timber or wood may be

applied, and consequently to state the whole extent of the benefit, is not, perhaps, within the compass of possibility.

SECTION II.

ON THE CAUSES OF THE INTERNAL DECAY OF TIMBER.

THE principal reason why former attempts have not generally succeeded has been, that their authors have not considered the primitive question in its full extent, but have taken it up only just at that part when decay appears, in which it was evident that the application of some remedy was necessary ; though, it is plain from their failure, that they had no idea of what kind the relief ought to have been. They have not endeavoured to trace the cause and source of the evil, by an investigation of the circumstances attending the growth of the tree, from the time when it first begins to shoot up from the earth, or the decay of it, since it arrived to maturity ; but have confined themselves solely to the object of stopping its progress, by the application of some palliative, which might, for a time, counteract or retard putridity. They were not aware, that the natural constitution of the tree might, perhaps, produce some principle hostile to that on which their system was founded : nor have they been sensible, that the union of two principles, innoxious in themselves, might produce a third by no means of the same nature ; and that, although their proposed remedy might not be calculated to increase either of the two first, it might yet prove ineffectual to prevent the production of the last, and so be defeated in its intention.

To avoid a similar inconvenience in the present case, the nature, constitution, and growth of timber and other trees, in all their various stages of progress, either to maturity or subsequent decay, have been most assiduously studied and examined ; and the inquiry has produced the following observations as its result, which, as being the only solid foundation on which a remedy can be applied with any hopes of success, are here communicated.

The laws of matter and motion, of gravity and attraction, are by no means peculiar to the solar system, but equally prevail in the animal, vegetable, and mineral kingdoms also ; and without the assistance of the laws of motion, no phænomenon in nature can be successfully investigated or explained.

Now, the first law of motion is, that all bodies have an equal indifference to motion or rest, and therefore require some other power

to put them into either of those situations. If once at rest they continue so till some power, acting upon them, sets them in motion; and when once put in motion, they persist in it, moving in the direction of a straight line, unless some other power interposes to check their motion, and set them at rest. Till this power occurs, their motion will still continue the same as at first, even after the power, which set them in motion, is removed; for the power of motion, having been once communicated, does not require constant application or continuance, unless some impediment, such as the air, &c. be encountered.

The second law of motion is, that the degree of motion is always commensurate to the force applied; and that the change, from rest to motion, or from motion to rest, is never sudden, but gradual, from one degree to a less, and so ultimately to the contrary of its original situation; and that the proportion of these minor degrees is always adequate to the power opposed. A body at rest, when acted upon by any power, yields to that power, because it has not the contrary faculty or quality of resistance: it moves in the same straight line in which the force applied is directed, and acquires a greater degree of velocity in proportion to the greater degree of the force of the power applied; so that, if the power be increased to twice its original force, it will communicate a double degree of velocity to the object on which it acts. If its power be advanced to three times, the velocity will be increased to three times also.

To apply these principles to the present purpose, it is only necessary to observe, that, by the action and power of fermentation, the effect of heat and moisture united, the vegetation of a tree is set in motion, and that heat and moisture are the vital principles for the growth and nourishment of the tree: by a chemical union they produce fermentation, which creates motion, and would, in itself, destroy the tree, if it were not for a continual supply of cool matter from the roots, and the faculty of discharging, by evaporation, all the superfluities of heat and moisture in perspiration, thus preventing putridity.

But when the tree is cut down, although it contains the quality of being acted upon by heat and moisture, it loses those powers, from the want of a supply of the juices from the roots, and the faculty of discharging, by evaporation, the superfluities of heat and moisture, from which putridity proceeds; the consequence is decay.

The motion of the juices is as necessary for the preservation of the growth of the tree, as rest, in the same matter, is necessary for the preservation of the timber, when cut down. If the former is

stopped, the tree dies : if the latter is set in motion by fermentation, the timber rots.

Heat and moisture, when in unison, never fail to produce fermentation in the juices of timber ; and the property of fermentation is to expand, distend, and dilate the tree, when growing, and to cause corruption and putrefaction, after it is cut down. In both cases it is the same principle, motion by fermentation, which occasions the effect ; and that only by the same means and method, the motion or agitation of the juices.

Matter and motion are still further exemplified, in the case of the vegetable kingdom, by the circumstance that, in all its productions, from the tenderest flower upwards to the sturdy oak, they are propagated by portions of matter comparatively very small ; such as merely a seed, or a slip, or cutting, which, if not sown or planted, would remain at rest ; but, when sown or planted, the power of vegetation sets their juices in motion ; and this motion, however small in degree, will not stop or cease, without some cause to impede it. Frost, and the chill of winter, will, for a time, check vegetation, till the sun has acquired sufficient power to set it again in motion : and thus it is, by the power of setting vegetation in motion in the juices, that the tree grows and expands ; and, from a mere shoot or acorn, in the case of the oak, becomes, in the space of about two centuries, a stupendous and magnificent tree.

While the juices of the tree proceed in their natural direction, and the same proportions of heat and moisture, as settled by nature, are preserved, which, of course, they in general are, so long as the tree is standing and growing, the effect is visible in the consequent health, improvement, and increase of bulk, and also in the production of the external foliage peculiar to its kind or species : but, if the course of its circulation be impeded or checked, or the quantities and proportions of these principles of heat and moisture be varied, as they sometimes are, by the intervention of some accident, when growing, and, more usually, after it is cut down, the consequence is seen in a deviation from the usual mode, by decay, sometimes by the production of fungi, a species of spongy excrescence or protuberance, affording a certain sign of the approach of internal putridity : for, in this last case especially, the tree, when cut down, does not lose the principles of vegetation, but they remain, perhaps, for a time, inactive, though certainly capable of being set in motion, till at length they are forced into action by a change of temperature, or the exposure to different elements : and this naturally leads to the consideration of the point as to equality of temperature, and the effect produced when that is not the case ; from which it will be decidedly shown, that the premature decay of timber is occasioned by its own internal acetous matter in fermentation ; and its decomposition or

destruction effected, by the circumstance of the concrete juices being forced again into motion by some accident, or by some change, which has taken place in the relative proportions of heat and moisture, which will be explained in the next section.

The construction of timber is not sufficiently studied, so as to account for the longer durability of some ships to others; and more particularly to those which have been noticed for their length of service, viz. the Royal Sovereign, Royal William, &c. The above two ships were built by royal order: the timber was particularly selected from an immense stock, of which at that time England could boast. It is evident, from the following extract, very large timber was selected, which will lead to, and prove the point, which I wish to establish, that the centre of the tree is the most prone to decay, although no appearance of decay is visible when the tree is cut down.

Extract.—In “a description of his Majesty’s ship Royal Sovereign, built at Woolwich in the year 1637, to the glory of our English nation, and not to be paralleled in the whole Christian world, one thing is particularly worthy of remark at least, if not of admiration (her timbers); one oak tree made four of the principal beams of this great ship.”—“In the year 1684, which is 47 years after she was built, her planks were stripped off, and the original timbers that were then remaining in her were sound, and no easy matter to drive a nail.”

The centre of all vegetables is the tenderest part: and in the very centre of a tree lies the circle of propagation; which, if possible, should always be cut out, as it is the first part to decay, after the sap. A beam made of one whole tree, may be stronger than one of the same size cut out of large timber; but if a tree is large enough to have one or two saw-cuts down the centre, the circle of propagation is cut out, or laid open to season, therefore beams and other scantling cut out of large timber are not so liable to decay; which I conceive is proved in the case of the Royal Sovereign, and no doubt was the case with the Royal William, &c. Hill, on the construction of timber, is very elaborate on this subject. He proves that all new shoots protrude from the very centre of the branch, and that in the very centre of the trunk and the branches, the same component parts of the tree lie in embryo; that is, in the very centre is a circle, consisting of rind, bark, sap, and heart, ready to protrude whenever nature calls them forth: this circle is what has often been erroneously taken for the pith; and when the tree has arrived at maturity, it is the first part to become rotten: hence, hollow trees, and the cause of beams and girders being often rotten, when the smaller scantlings are sound: this circle contains more acid in proportion, consequently more subject to fermentation.

It is proved by Mr. Goetling, in Crell’s Chemical Journal, 1779,

that all timber contains, more or less, the same kind of acid, which is chiefly composed of hydrogen and charcoal.

There can be no doubt, but it is the acid that causes fermentation in timber, when placed in a situation favorable to create it—which it is the property of my process to prevent.

My opinions upon the cause and effect of premature decay, and the various causes of decomposition in timber, may appear new, particularly to those who have fallen in with the old opinion; still, should the opinions of others be considered more consistent, as to the origin of the disease, my remedy to effect the preservation of timber is the same: I have only to observe, my experiments bear me out, and support my opinions; and that my rules are grounded, according to Sir Isaac Newton's lesson, "by just inductions from experiments and observations, to discover the laws of nature, and then to apply those laws to the solution of the phænomena in question."

SECTION III.

ON THE CONSEQUENCES OF EXPOSURE, IN THE CASE OF TIMBER, TO INEQUALITY OF TEMPERATURE OR ATMOSPHERE.

A TREE, while growing, is, at all seasons of the year, exposed to two different degrees of temperature at the very same instant; for the part above the ground is subjected to one degree of atmosphere, while the roots, and that below it, are as certainly placed in another. In winter the roots are in the warmest, and the upper part in the coolest temperature or situation; and frost and cold, by checking, in the upper part, the necessary heat, put a temporary cessation to the progress of vegetation, so as to reduce it almost to rest. The utmost, therefore, which the roots can do, secured, as they are, from the inclemencies of the weather and the severities of frost, by being buried in the ground, is to preserve, in nearly a state of comparative inactivity, a supply of those principles of heat and moisture, in their necessary proportions, which may afterwards be set in motion, when the return of summer and genial warmth shall restore to the upper part of the tree the activity of vegetation. If it were not thus, the tree must die, for want of the necessary materials to sustain it; and it is the absence of this supply, and that renovation from the earth, of which the tree is deprived, when it is cut down, and consequently severed from the earth, its parent, that prevents a tree, when cut down, from vegetating as when standing. The reason, therefore, why the vegetation of the tree is checked in the winter, is this, that by the

wet the moisture is increased, and by the cold the heat abated ; so that the proportion of the former is rendered greater, and that of the latter less, by which means the relative proportion, established by nature, as necessary for the progress of the growth of the tree, becomes destroyed.

In the summer, the situations are exactly reversed ; for then the roots are in the coolest station, as being protected from the heat of the sun, and the upper parts of the tree are in the warmest, as being exposed to its rays. And as this tends to relax the rigidity and stiffness of the fibres of the tree, and to counteract the effect of the cold in the upper parts, by opening those pores which the cold had closed, and expelling that moisture with which they had been filled, the proportion of moisture, which the tree had acquired in the winter, becomes lessened, and the heat increased ; so as to restore the necessary vegetative power. Vegetation is, therefore, then active, and the operations of nature are exerted in full force.

It is evident, that, in this process, the juices enter the roots in a cool and unfermented state ; and are permitted to ascend, according to their nature and aptitude for that purpose, through capillary tubes, to the top of the tree and the extremities of its branches, which they cannot effect in winter, because the stiffness and want of elasticity in the fibres, occasioned by the operation of the cold, produce a degree of resistance to the ascent of the fluid of the juices, which that fluid is unable to overpower. But, in summer, the warmth of the sun opens the pores of the upper part of the tree, relaxes its fibres, and removes that impediment to the ascent of the juices by which they had before been checked. The juices of the tree, in their passage to its summit, and to the extremity of its branches, naturally acquire the principles and nature of the tree, so as to give them a tendency and propensity to produce one kind of foliage, in preference to another ; and, as what is thus communicated from each tree must, of course, bear a relation to its own species rather than to any other, the juices, thus impregnated, become capable of producing that kind of foliage peculiar to the species of tree through which they have passed.

As motion is the cause of friction, and friction produces heat, which may, in the instance of solid bodies, be so increased as to burst out into a flame, so fermentation is, in the case of vegetable productions, the consequence of heat and moisture united and confined ; and hence must arise, from the over action and exertion of the parts, a degree of heat which would infallibly tend to putrefaction, were it not, that the juices, which, when acted upon, emit their superfluous heat by exhalation and perspiration, and receive and admit in exchange, through the valves, which operate as pumps, a

sufficient portion of cool and fresh air to counteract any such effect. Fermentation is, therefore, the principle of action in the juices, and the cause of vegetation; and, when thus corrected by the immission of fresh air, the health of the tree is preserved. During this active state of vegetation, the tree is under the influence of a high and low temperature: the roots are about 40, and the branches, &c. from 60 to 80; and, according to the different degrees of temperature, so is the slow or vigorous motion in vegetation created.

Similar causes must always be attended with similar consequences, so long as the bodies, to be acted upon, continue to possess the same qualities. And it is certainly true, that between a tree standing and growing, and one felled and cut down, there can be no essential change or difference of the principles and elements of which it is composed. In both cases it is capable of being acted upon by heat and moisture, though it no longer retains, when cut down, as in the instance of the tree when standing, the power or faculty of expelling, by exhalation or perspiration, the superfluous heat occasioned by the over action of fermentation. Unless, therefore, that power can be set at rest, and the effect of heat and moisture be in themselves destroyed, or some counteracting medium be interposed, so as to prevent the operation of heat and moisture on the timber, it is evident that the internal fermentation, unchecked, must be perpetually, though silently, undermining its health and soundness; and most certainly, though progressively, effecting its gradual destruction. The tree, therefore, whether felled in spring or in autumn, consists of exactly the same component parts or elements, and is full of the same juices, which, although suspended in their operation by the stop put to its vegetation, in consequence of its being cut down, are yet liable to be revived and called again into action, whenever any other cause than vegetation shall be found sufficient to give rise to that same degree of fermentation which that had formerly produced. And this, in the case of timber cut down, may be effected by local situation and an exposure to heat and moisture, either at the same time, or in uncertain and various succession; to which, on numerous occasions, it is frequently found to be subjected.

In the case of a ship, the ends of the beams are situated between the inside linings and the outside planks; the top surface is covered by the floor of the deck, and both the ends and top surface are thus subject to much damp vapor and moisture. For, besides the portion of damp occasioned by the quantities of water with which the decks are perpetually sluiced, for the purpose of a due attention to the indispensably necessary objects of health and cleanliness, the space between the inside linings and outer planks acts as a gas pit, from which the noxious vapor from the hold ascends, and this is absorb-

ed by the ends of the beams, so as, in time, to produce putridity. The other three sides are between decks, and at least so far dry as not to be exposed to actual positive wet ; but existing, as they do, in a heated atmosphere, from the closeness and confined space, are liable to be acted upon by an unwholesome and destructive caloric and effluvia, exactly calculated to promote the principles of putrefaction, for want of a sufficient quantity and circulation of fresh air to carry it off. By this the juices of the timber are, through the means of the fermentation thus excited, put into motion ; and the timber is perpetually emitting and absorbing again, without any correction of their noxious qualities, the principles of putridity, which it is the office of the fresh air, when it can be permitted to act freely, to absorb.

In these two comparative situations, the difference of temperature has been found, by actual experiment and computation, to be far greater than any one, who had not tried it, would be inclined to believe or imagine. For those parts of the beams between the linings are placed in an atmosphere of about 40 degrees, while those between the decks are exposed from 60 to 80 degrees. This is exactly the same difference of temperature as is required to produce active vegetation in the growing tree, and which is the sole cause of the decay of timber in ships ; and whenever it has happened that a ship has been very soon destroyed, it has been that the inequality of the temperature of the atmosphere has been great, which is sufficiently evident from the circumstance of the different degrees of soundness or decay in the different beams, according as it has happened they have been more or less exposed to the influence of both heat and moisture.

Again, we see fir timber floated up and down the river, for a considerable distance, from one place to another, or suffered to lie soaking in the river for months together : three sides of the piece of timber are evidently exposed to positive wet in a very great degree, nay, even to saturation ; and the fourth, being the upper side, is subject to no degree of damp or wet, except what it may occasionally experience from the rains or dews, but has to sustain the effects of the air and sun : so that the three sides are positively wet, while the fourth is, in all respects, the reverse. No one can doubt that the atmosphere and temperature of the two situations are abundantly different ; nor can any one imagine any other than that the disparity in its consequences must be equally great ; and that the timber must be very much affected by that cause in the different parts, in proportion to the greater or less degree of heat or moisture, to which it is liable or exposed. If timber is always kept in the same position, so that the very same parts, and no others, should be constantly exposed to either of the two degrees of temperature above mentioned, and

to that only, while the rest of it was subjected, as above, to the influence of the other, (but it is, beyond all dispute, so situated in ships and buildings,) this irregularity of temperature must necessarily introduce putrefaction and decay; and this is most certainly the cause of all decay and destruction in fir and all other sorts of timber.

No piece of timber, however solid and sound in its own nature and constitution, can, for a constancy, stand the existence in a difference of temperature at the same instant; viz. one part wet and the other dry. Nor can it, for any considerable space of time, support the variation of being alternately wet and dry; and Sir Christopher Wren has himself noticed, that Venice and Amsterdam, being both founded on wooden piles, immersed in water, would themselves fall, if the constancy of the situation of those piles, in the same element and temperature, did not prevent the timber from rotting.¹

The Alhambra Palace in Spain, supposed to have been built 3000 years, and mostly of timber, is preserved by the constancy of the temperature, supposed to be prepared with some composition.²

The same principle of equality of temperature is no less necessary to be observed in the application of timber to any of the purposes of common life. And in no case is it more requisite, than in the erection of houses and other edifices, whether for the purposes of private or public utility. But even in these, it is not uncommon to see timber so placed, and in such an inequality of temperature, that it must inevitably be destroyed, as it invariably is, in a short space of time, by that species of decay well known by the appellation of the dry rot. For instance, what can be more to the prejudice of timber, or more hostile to the idea of its preservation or continuance in health and soundness, than using it in the manner in which it is perpetually employed for boarding kitchens and other rooms, on the ground floor, where three sides of the joists, and the lower face of the flooring, are bedded in earth so moist, as to amount almost to positive wet, while the upper side of the joists, and the upper face of the flooring, is perfectly dry, and exposed to the effects of heat, from a large fire perpetually burning. The consequence of this has invariably shown itself, from time to time, in the circumstance of joists and flooring, laid down sound, and becoming rotten in a few months. Instances can be produced of two entire new floorings, laid down in the very same kitchen, in such a situation,

¹ See his Letter to the Bishop of Rochester, inserted in Widmore's History of Westminster Abbey; and also in Wren's Parentalia.

² See Murphey's account of this Palace, published by Cadell and Davies.

in less than ten years, besides the necessity for a third at the end of that time; independently of partial repairs, from time to time, and removing decayed pieces as soon as they were discovered.

Even where it has not, as here, been injudiciously or improperly placed, in situations so calculated to promote its very destruction, that it would have been wonderful had it escaped; it has been found impossible to prevent its occurring in practice in the use and application of timber to those very purposes, for which it was apparently and evidently intended. Beams of the greatest soundness and health, that could be selected with the greatest possible care and judgment, and some of them of great strength and magnitude, have, in a very short period after they had been introduced into the walls of dwelling-houses, manufactories, brewhouses, and other similar erections, been discovered, although not apparently exposed to heat or moisture, subject to the dry rot; because some secret external or accidental circumstance, which could not be accounted for at the time, had imperceptibly introduced heat and moisture united, and so caused fermentation, by setting in motion the internal juices of the timber. Nor has the utmost degree of sagacity or foresight, which could, as yet, be exerted, been sufficient or able to secure every edifice or erection, with certainty, from experiencing more or less, in a very short space of time, the decay and destruction of some of its timbers; or the owner, from the necessity, in some cases, of perhaps taking down and re-erecting the whole, for fear it should fall.

It is not, however, to be inferred, from these, or any other circumstances, that this natural propensity in timber to putridity and decay is necessarily invincible; or that it may not be conquered and effectually subdued, by a proper application of fit and adequate methods, already perhaps in existence. Neither is it to be hastily concluded or imagined, that because all former attempts for the purpose have hitherto failed, all future endeavours must in like manner be equally destitute of success. On the contrary, the possibility and practicability of such a remedy is here intended to be established; and it is only owing to their being founded on false principles and erroneous ideas, that all other attempts have missed their aim. The facts already stated, which cannot be controverted, have already decidedly shown, that no proposal for this object can succeed, which does not rest on the principle of excluding foul air by means of a pre-occupation of the pores, by the interposition of some medium in such a manner, as to prevent the possibility of its ever being admitted at any future period, by any circumstance whatever. And this can only be effected by saturating the timber with some such impenetrable composition, *not to be soluble in water, or moveable in a temperature under 200*; and if timber can be

made to resist that degree of temperature, there is no situation in which it can be placed that will effect it; and it must be sufficiently potent and efficacious to repel any attack from heat and moisture, and to prevent their union from operating in any manner on the timber; by which means it may be rendered capable of being employed without any injury in any situation, however unfavorable. Such a remedy has actually been found; what it undertakes to perform will be more succinctly stated in the ensuing section, and the evidence of its actual success will also be seen in subsequent pages, in an enumeration and particularisation of a series of experiments, made in every way in which it was judged possible to try and ascertain its validity.

SECTION IV.

ON THE NATURE OF THE PROPOSED REMEDY, AND THE SEVERAL OBJECTS TO WHICH IT IS APPLICABLE.

THE general object of the remedy intended to be proposed, or suggested, which consists in the application of a liquid composition, is the very important and weighty purpose of rendering timber, after the application of the composition, impervious to moisture of any kind; and so effectually is this object attained, that the liquid introduced, by which the destructive matter is expelled, can never itself be dislodged; but it lies in the pores in a concrete state, and presents an invincible opposition to all other fluids.

By this introduction, the timber, as has been actually ascertained by experiment, is capable of being so increased in strength, that though a *section of rotten* oak branch, not prepared, was broken by the weight of 34 pounds; the other section of the same branch, prepared with the composition, could not be broken by the weight of 112 pounds; 207 pounds was afterwards tried without breaking the section.

Strength and durability being its general quality, and undoubtedly a very extensive object, it is almost superfluous to say, that it must be of the greatest utility possible in every branch or department in which timber, or wood of any kind, is employed; and as these are so various, it is impossible, and therefore hopeless to attempt it, to particularise or enumerate them all.

The power and effect of this composition is so great, that it cannot be evaporated, forced out, or extracted, either by damp or the heat of the sun, nor by any exposure or confinement.

Nor will the timber be liable to contract or expand, the pores being made completely impervious to moisture.

The additional strength given to timber is, by uniting and consolidating the component parts of which it consists, even by making the sap of oak equal to the heart.

It will effectually prevent the dry rot; because the internal juices cannot be set in motion, as heat and moisture, the parents of fermentation, cannot find admission.

And as, after the application, the timber becomes impervious to wet and moisture, it is evident that no fungus can be generated; nor the high state of fermentation be created to destroy it in the form of gas.

The increase in the strength of timber, after the application of the composition, has been found by experiment so great, that a beam of fourteen inches square will be rendered equal in strength to one of sixteen; and one of ten and a half inches to another of twelve, &c.

The reduction of scantling, which it is obvious may be made in consequence of the above fact, and which may equally take place in all cases, without exception, in which timber is used, would, in itself, be, in a very short time, an immense saving of expense and timber, with the additional circumstance of an increased durability; and the advantages, to state it only in one instance, would be, that a ship might be constructed many tons lighter with equal strength, and the cargo will be securely protected from damp and mildew.

In the red and yellow pine, the increase of strength has, on experiment, been found equivalent to one sixth; so that scantling, one sixth less, would be equally strong, and might be used with safety. And it is certain the yellow pine, prepared with this composition, is equal to red, or at least to red not so prepared; or, to express it perhaps more intelligibly, to the present strength of that species, so as to make inferior yellow equal to the finest red.

The size of masts and spars might be much reduced in consequence, and upon the principle of the additional strength they would receive from this composition.

Boats and barges would be rendered much more secure from leaking, &c. by the use of this composition, as well as stronger, and not so likely to be staved, &c.

This composition acts also very powerfully upon iron; for, if prepared, it may be exposed in the rain for years without contracting the least rust.

All the timber and iron used in the Ordnance department would also be greatly improved by this composition, not only in resisting the effects of wet and dry, heat and cold, but also in the reduction of scantling, and the increased durability both of wood and iron; consisting of every material used in artillery, fortifications,

&c. such as gun-carriages, platforms, waggons, &c., no matter what climates ; they must, in equal degree, be benefitted from the application and use of this same composition, as neither heat or damp can extract it.

In all the purposes of common life the utility of this composition would be no less conspicuous. In wood buildings, and the wooden materials used in brewhouses, it would be invaluable, as it will resist the effects of steam, so very prejudicial to timber.

The properties and qualities of the principal article in the composition have, to a certainty, remained hitherto generally unknown to the world at large ; and the composition has never been applied by the most sagacious to the present purpose, for which it is peculiarly adapted.

These, and multitudes more, the full extent of which time only could completely develope, would be the infallible advantages resulting from the use of this composition ; for in short, there is nothing constructed of wood or iron, of whatever kind it may be, to which it is not applicable, and which would derive considerable advantage from such an application. And there is no doubt but all the purposes of bending timber and planks may be effected by the composition, instead of boiling in water, by which means the dry rot in ships has been greatly promoted.

SECTION V.

PARTICULARS OF EXPERIMENTS, ACTUALLY MADE, FOR THE PURPOSE OF ASCERTAINING THE EFFECTS OF THE REMEDY PROPOSED.

SUCH are the effects to be expected from the use and adoption of this composition ; and in order to evince that these expectations are not destitute of the necessary solid foundation in fact, a sufficient number of the numerous and various experiments made on this occasion, although they bear but a very small proportion to the whole aggregate, are here minutely stated.

1. Two sections of white deal, each weighing one pound thirteen ounces avoirdupois weight, were immersed for six days each, the one in water, the other in composition ; at the end of which time they were each taken out, and again weighed : that which had been in the water had absorbed nine ounces of water ; and that in the composition two and a half of composition.

2. Two similar pieces of yellow deal, weighing each two pounds eleven ounces, were in like manner immersed for six days each, the one in water, the other in composition ; after which

time they were taken out and weighed : that which had been in the water had absorbed six ounces of water ; that in the composition, four of composition. The water, both in the white and yellow deal, was all evaporated on the second day after the sections were taken out ; but the composition in the other two sections remains to this time ; viz. from the month of June 1817 to that of February 1819, without any loss or diminution, dry and hard.

From this it appears, that white deal absorbs more water and less composition, in proportion, than yellow ; and the quantity of water absorbed by the white, accounts for its rapid decay in external situations. Nine ounces addition, is equal to one-third of its original weight ; whereas six ounces, the additional quantity obtained by the yellow in a similar manner, is not quite one seventh. This accounts for white deal perishing so much sooner than yellow : the greater the quantity of water absorbed, the quicker is the timber destroyed ; for instance, a piece of seasoned oak would, in the same time, six days, only absorb half an ounce ; so that in a damp situation, the white deal would be rotten in three years, whereas the oak would last 36 years ; viz. twelve times as long ; and the yellow deal, upon the same calculation, would last about twelve years.

3. The two pieces of white and yellow deal, which had been immersed in the water, were again placed in water for another similar period of six days, and at the end of that time weighed : they were found saturated, but had absorbed about half an ounce of water more than before, which is a proof of decomposition in a small degree (for there must have been a loss of wood to have made room for more water. Timber may in time be completely dissolved by being repeatedly saturated with water, and as often desiccated : this proves that improper seasoning will breed the dry rot :) they were then immediately immersed full of water in the composition, for another similar period of six days, and being at the end of that time taken out and weighed, were found to be nearly of the same weight as when they were put in. Being full of water, nothing more could enter ; the composition only made an external casing.

4. They were next exposed to the atmosphere, in the month of July, for six days, when no diminution in weight was produced ; the composition preventing evaporation, the water could not escape.

5. After this, they were both cleft asunder, and the whole of the water evaporated and was set free in about 36 hours.

This demonstrated that the composition was in itself impervious to the effect of heat, and that it had disunited the action of heat and moisture, although the composition itself was not dry : for

it is to be understood and observed, that the composition is a saturating solution, and not a coating like paint. It is well known that wet wood cannot be painted, therefore paint could not have done the same thing.

6. A piece of white deal plank, about 21 inches long, nine broad, and three thick, weighing about nine pounds, was prepared with the composition, lightly, and placed to dry for about 21 days in the autumn of 1817: it was then laid in a very heavy rain the whole day, set up on one end in a gutter, the upper end receiving all the water, which ran off from the roof: after continuing fourteen hours in this situation, it was found, on being weighed, not to have absorbed an ounce of water, (if the end of the plank had been planed instead of being a rough saw-cut, it would not have absorbed a drachm,) when a similar piece, which had been in like manner exposed in the rain, but without any preparation from the composition, had imbibed not less than eight ounces.

7. Two pieces of deal board, about nine inches square, weighing one pound two ounces each, were laid on the grass, in a very heavy rain, for fourteen hours in the country: one piece had been prepared with the composition, the other had not; that prepared was, when weighed after this exposure, precisely of the same weight as when it was laid down; but that unprepared had acquired, by absorption, an additional weight of two ounces and a half.

This evidently proves, that water is not admissible into wood so prepared, though from wood unprepared it cannot be excluded.

8. A chump of oak, about twenty-one pounds in weight, with two bolt-holes in it, was laid in the composition for a few days; at the end of that time, two iron bolts were driven into the holes, and the ends, in order to keep out all atmospheric air, were secured by pieces of lead. This piece of oak, so treated, has been put in damp situations, and even in water for weeks together at a time, and then deposited in a vault, where, from confined air and damp, much carbonic acid gas is produced: here it continued thirteen weeks, and at the end of that period it was taken out and exposed in different atmospheres or temperatures for eighteen months, after which the bolts were driven out, when they were found uncorroded by rust, and as fresh as if they had just come from the smith's forge; for the composition had prevented the gallic acid from flowing, or even moving, so that no fermentation could take place.

The next class of experiments was directed to the ascertainment of the effect of the composition on decayed wood, in the several stages of its progress towards destruction, and the following observations are the result:—

In all cases in which decomposition or destruction has been effected, it has been uniformly found, that the internal and external parts have been distended and dilated, and that the sharp edge which the piece of wood has originally had, has become rounded or blunt; but even this may be in proportion to the greater or less degree of decay.

9. A piece of dog-wood, taken from a close hurdle, so very rotten in itself as hardly to bear the touch, was broken in half: one half was laid in the composition, and the other half exactly in the state in which it had been broken off: that laid in the composition, became in twelve months time so changed from what it had been, that had not the circumstance of the exact correspondence of its irregularities with those of the piece from which it had been broken, plainly shown it to have been the same identical piece or section, it might reasonably have been conjectured that it had been substituted instead of the former; for the internal and external distention of the parts became wholly reduced; and, by the consequent shrinking of the parts into their natural and original size, the edge was rendered as sharp as when it was first cleft by the hurdle-maker.

10. A piece of rotten oak branch, about twelve inches long, and one inch thick, which had been blown down by the wind in the month of February, 1818; the whole branch was covered with moss, and so extremely tender, as to snap with its own weight only. This piece of twelve inches long, was broken into two sections; one of them was prepared with the composition at that time, the other remained in its rotten state. On exhibiting these experiments in the month of February, 1819, before two scientific gentlemen, particularly conversant in chemistry, it was proposed to break the above-mentioned two sections of oak, in order to show, that the composition had, besides an antiseptic, or antiputrescent quality, the power of communicating also a considerable degree of additional strength. The section not prepared broke, and no wonder, with abundant ease; and it was expected that although the other would probably require more force and exertion, yet that also would still be capable of being, by an adequate degree of power, in like manner broken. But this was not the case; for the power of the composition had so far exceeded the degree of strength attributed to it, that after several attempts, it was found impossible to break the piece which had been prepared.

It is not here intended to rest on the utility of applying this composition to wood, where destruction has already gone too far, as it is to show the possibility, to prevent it from ever beginning—an object of infinitely greater importance. But these experiments unquestionably lead to, and justify a very rational conclusion,

that if, as here, the composition has been sufficiently powerful to arrest destruction in its progress, it cannot be less efficacious in preventing decay from ever occurring,—a matter of certainly less comparative difficulty.

The success of the above trials, in the case of decayed wood, naturally led to another class of experiments, of a similar kind, on those sorts, which were in their own natures and constitutions soft and porous, in order to decide, whether even they might not be rendered firm and solid, and equally capable of effectually resisting the attacks and efforts of early decomposition and decay.

11. Accordingly, two pieces of a tender larch pole were chosen for this purpose; one piece was saturated with the composition, the other left in its tender, light, and natural state. That prepared became dense, solid, heavy, and hard, more resembling box or yew than larch, or the piece from which it had been taken.

Several similar experiments have been also tried upon fir, the specimens of which can be easily produced; and some of these have been done not less than two years, and the pieces are now so compressed and hard, that they resemble oak in firmness.

The nature and cause of this effect, may, perhaps, be rendered more intelligible, and its credibility be further established, from observing and considering the following particulars, which come under almost daily notice and observation, in the exercise of a very familiar trade or occupation, of which few persons of intelligence can be supposed wholly ignorant.

The operation of the composition upon the various sorts of wood, in these instances, is to expel and dislodge the fixed air from the pores; and, by introducing and placing itself in its stead, to prevent its return into the pores which it formerly occupied. The very same effect is produced, upon precisely the same principle, in the process of binding a book; and there is just the same apparent difference between the weight of the sheets before and after they have been beaten, as they always are, when in reality there is no difference, as one necessary step to their being sewed together and bound. In the former state, the portions of air, with which all the leaves are filled, tend to support and appear somewhat to lessen the natural weight of the sheets; but when, by the operation of beating, those portions of air become expelled, the whole mass is rendered dense and heavy, because there is no interposing medium to abate or relieve its pressure on the hand, and its specific gravity therefore increases, and it appears to become heavier, in proportion to its bulk, than it was at first. What in the case of book-binding is effected by manual labor,

is on the present occasion produced by the mere use and application of the composition.

The next succession of experiments was intended for the purpose of ascertaining, whether the composition could or not, in any way or to any extent, be extracted or expelled, or forced out by any high degree of temperature, or by the alternate variation from high to low, or from low to high.

12. To decide whether the composition could be disturbed or set free by heat, some pieces of all sorts of wood were desiccated, or well seasoned, and then saturated fully with the composition : after the composition became somewhat concrete, they were for three days placed in an oven, heated to not less than 80 degrees, but it had no effect ; for no loss of weight was sustained, or next to none, that being fixed air, for it amounted to no more than a drachm in a pound, which does not exceed a one hundred and twenty-eighth part ; nor was there any appearance of external motion, which proves the composition immoveable by confined heat.

13. They were then placed in water for several days, and again deposited wet in the oven, heated as before ; but still there was no effect to disturb the composition, although the pieces had sustained alternate heat and moisture, and afterwards been again subjected to heat.

14. A piece of larch, weighing six ounces, having three ounces of composition in it, which is a very great portion, and must have moved, if it were moveable, was boiled for two hours in water ; but still there was no effect, either to dissolve the composition, or admit any fresh quantity of water ; if it had been possible to dislodge or extract any of this composition, surely this experiment would have done it.

15. A piece of oak, of about two inches square, having in it full half an ounce of composition, was also boiled in water for six hours ; but there was still no effect towards disturbing or setting free the composition ; and it was considered, on this occasion, that the smaller the cuttings or sections, the more severe the effect.

16. Sections of deal boards, prepared with the composition, and others not prepared, have been laid in the ground in a wet ditch for several weeks together : in this case, the sections prepared have become somewhat heavier, but when placed in the oven, they returned to their former weight as before put in the ditch, but not less. The increase in the weight would, however, never have occurred, had the wood been completely saturated, which it was not.

The case was evidently different from that above described, with the sections not prepared with the composition, for those pieces were double their original weight when taken out of the

ditch, but much reduced in their original weight after desiccation in the oven: these circumstances evince, that there was in the latter case some degree of decomposition, but none in the sections which had been prepared, as they could not be reduced below their original weight when put in the ditch.

Though wood becomes, in consequence of being repeatedly wet and dry, liable to be sometimes heavier, and sometimes lighter, in proportion as heat or moisture most prevail at the time, yet the tendency of seasoning or desiccation of timber is at all times to render it lighter than before, and intended to give it the power of always afterwards continuing so, without experiencing any increase of weight in consequence of any moisture to which it might be afterwards exposed: but this can be only to a certain extent; and after it is once thoroughly dry and seasoned, it will still always vary in weight when exposed afresh to wet and dry, unless it is prepared with this composition.

The foregoing experiments, though made at first only with a view to substantiate the facts which they are here adduced to prove, have also led to a very important discovery, by means of which timber, of any dimensions, may to a certainty be perfectly seasoned, without cracking, rending, or splitting at the ends, and this by a method completely practicable.

So important are the points decided by the foregoing experiments, that it is imagined few other tests can be suggested; and at present, indeed, only the following question has occurred to the mind of the author of this Treatise, as necessary to be solved,—whether the composition has or not, the power and ability to prevent the formation of fungi in decomposed wood? For the ascertainment of this, several experiments were tried: no one failed; and the result of the whole resolves itself into the following conclusions, which, in order to render them more intelligible, it has been thought necessary only thus briefly to state.

17. A section of decomposed light elm slab, about twelve inches square, all sap, but apparently dry, unprepared with the composition, was placed in a cupboard, and produced, at the end of ten weeks, an appearance of fungus, covering about two inches in length and one in breadth.

18. Two similar sections from the same slab, prepared with the composition, but deposited in a damp vault, known to contain carbonic acid gas, at the end of the same period of ten weeks, produced none.

The unprepared section above-mentioned (17), which had lain for ten weeks in the cupboard, and on which a fungus had already appeared, was cut in half: one of these half sections was placed in the vault, and in four days the fungus had considerably increased.

At the end of ten days, the whole piece was completely covered with a milk-white Turk's cap and Jew's ear fungus. This section was several times disturbed for the purpose of exhibiting, which broke off the fungus; but, upon being replaced in the vault, it always again recovered its growth: one of the sections (18) which had been prepared, and which had lain in the vault for ten weeks, without any appearance of fungus, was brought up and placed in the same cupboard for twenty weeks, with intention to ascertain whether the change might encourage the production of fungi; but at the end of that time it exhibited no appearance of fungus whatever.

The other section (18) of the prepared slab had now lain in the vault thirty weeks: at the end of that period no one symptom of fungus was produced; a sufficient proof, as it is contended, of the impossibility that fungi should generate on wood so prepared, even although it should have been decomposed.

19. In order that no question might remain behind unsolved, it was, in consequence of the effect which the composition was found to have had on the porous or soft woods, determined to try also what would be its effect on the sap or alburnum of oak. The composition was applied to some sappy loppings of oak, and it succeeded beyond the most sanguine expectations which could be formed. The specimen on which this experiment was made is to be seen, as well as all the others here mentioned, and without exaggeration, although no description can do justice to the effect; suffice it to say, that the sap or alburnum is harder and closer than the heart, and is equal to any purposes to which the heart can be applied.

20. and last experiment, was to prove, that oak or fir, that would not rend straight before prepared, is found to rend in great perfection after prepared, which is another proof of its compressive powers.

Timbers of large dimensions (if 18 inches square, and 80 feet long) can be done with facility; and with greater effect, as to strength and durability, than the small sections here taken for experiments.

SECTION VI.

CONCLUSION.

TIMBER can never so alter in its constitution, as that what will affect a small piece, should not equally operate upon a larger. And such has been the success of the experiments, already stated,

as to justify an assertion, that, if tried on a larger scale, their result would be the same. The only thing, therefore, which can now be wished for, would be a full and fair opportunity of trying, on an extended scale, the effect of the composition, by applying it, under the direction and inspection of its inventor, to some of the frigates or other ships now building or repairing in the several public and private dock-yards in this kingdom. To the granting such an indulgence, and the further additional means necessary for its success, by those persons, in whose power, from their situation, it is to grant the permission, and whose object it must unquestionably be to introduce into their several departments every really beneficial invention and improvement, very strong reasons may be adduced. For it is to be remarked, that every one of the above experiments is directed to, and tends to establish some very essential point; that the process and result have been so clearly stated as plainly to show how, and why it has succeeded; that by these means, the whole is rendered so extremely intelligible, that almost any one can judge of it; and that a failure in success is by no means probable, as it is manifest, from the evidence which he has produced in his pamphlet, that the author has a clear conception of the nature and extent of his subject; and has consequently expressed himself in terms, which cannot be mistaken or misunderstood; and it is the intention of the author to apply his remedy for the public good, if supported. This has not been the case with those, who have undertaken to suggest remedies: the whole of the pamphlets before written on the present subject, only recommend the public to try the remedies they propose, and publish their book for sale: the present treatise is not intended for sale, but may be had gratis. At some future period, a more elaborate treatise of the present matter, and all new matter that may arise, will be published in the usual way.

On the present occasion, it may fairly be asked, What more could have been done, than what was actually tried, to ascertain the real power of the remedy suggested? Can any one point out an error in the facts? a failure in the conclusions or deductions? or a fallacy in the arguments or reasons assigned? or can any impartial person, among all those best acquainted with the principles of chemistry, and the rules of logic and reason, affirm, with any hope of establishing such an assertion, that the facts here adduced do not amount, not only to probability, but even to mathematical demonstration? It cannot be denied, but that the object is one of the greatest importance to the nation at large, and to all individuals who have any concern with the use or employment of timber; and, under the above circumstances, it is hoped that those, in whose department it particularly lies, will in earnest exert themselves to enquire into the evidence of the facts here stated; a degree of atten-

tion to which, from their importance, those facts seem justly entitled. Further hopes and expectations are also entertained, that the result of that inquiry will be an inclination or disposition to adopt, if it is properly substantiated, the remedy proposed ; and a readiness to grant and furnish every necessary means in their power for a full and fair trial, on the largest and most extended possible scale. And lastly, the author trusts, in full confidence of establishing his assertions and conclusions, that neither prejudice in favor of former erroneous opinions, nor particular interest, should any such be exerted in opposition to sentiments better entitled to reception, shall be permitted to operate to the ultimate total exclusion, or as any impediment to the admission, of a project, which, if duly established, as it will be by experiment, may be justly considered as being, in its extent and utility to the public, perhaps one of the most valuable discoveries that has taken place, within the compass of the two last, or indeed of any preceding, centuries.

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